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09/611,817	07/07/2000	Jonathan D. Mohn	AMAT/4666/ETCH/SILICON/JB	6787

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EXAMINER

CROWELL, ANNA M

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Paper No. 0604

Application Number: 09/611,817  
Filing Date: July 07, 2000  
Appellant(s): MOHN ET AL.

\_\_\_\_\_  
Keith M. Tacket  
For Appellant

**MAILED**  
JUN 18 2004  
**GROUP 1700**

**EXAMINER'S ANSWER**

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This is in response to the appeal brief filed March 26, 2004.

**(1) *Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

**(2) *Related Appeals and Interferences***

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

**(3) *Status of Claims***

The statement of the status of the claims contained in the brief is correct.

Claims 1-11, 13-15, 21, 24-25, and 34-36 stand finally rejected.

**(4) *Status of Amendments After Final***

The appellant's statement of the status of amendments after final rejection contained in the brief is correct. An amendment after final was submitted on November 28, 2003 and has been entered. Claim 11 was amended to include limitations from the previously submitted claim 12 and claim 21 was amended to include limitations from previously submitted claim 23. As a result of this amendment, claims 12, 16-20, 22-23, and 26-33 have been canceled. No new issues are raised by this change, which was caused by this amendment. Examiner maintained the final rejection in Advisory action mailed on December 29, 2003, and indicated that the request

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for reconsideration was considered, but does not place the application in condition for allowance due to the outstanding rejections.

**(5) *Summary of Invention***

The summary of invention contained in the brief is generally correct.

The present invention is directed to an apparatus for processing a semiconductor substrate. The apparatus comprises a chamber body, a substrate support, an exhaust region, and one or more liners. The chamber body includes an internal volume defined by first and second cylindrical regions and by side walls extending substantially tangent between the first and second cylindrical regions. The first cylindrical region is defined as the processing region and includes the substrate support, and the second cylindrical region is defined as the exhaust region which is connected to the chamber outlet. A variety of chamber liners or inserts can be provided to the chamber body so that various chamber designs, for conducting various processes, are achieved without the need for changing the chamber body.

**(6) *Issues***

The appellant's statement of the issues in the brief is substantially correct. The issues are:

1. Claims 1-4, 11, 13-15, 21, and 24-25 are unpatentable under 35 U.S.C. 112 second paragraph.
2. Claim 1 is anticipated under 35 U.S.C. 102(b) by Tepman et al. (U.S. 5,730,801).

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3. Claims 2-4 are unpatentable under 35. U.S.C. 103(a) over Tepman et al. in view of Benjamin et al. (U.S. 5,820,723).

4. Claims 11, 13-15, 21, and 24-25 are unpatentable under 35. U.S.C. 103(a) over Tepman et al. in view of Shan et al. (EP 0814495 A2).

**(7) *Grouping of Claims***

Appellant's brief includes a statement that claims 1-4, 11, 13-15, 21, and 24-25 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

**(8) *Claims Appealed***

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(9) *Prior Art of Record***

5,730,801	TEPMAN ET AL.	03-1998
5,820,723	BENJAMIN ET AL.	10-1998
0814495-A2	SHAN ET AL.	12-1997

**(10) *Grounds of Rejection***

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-4, 11, 13-15, 21, 24-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 11, and 21 recite the limitation, “substantially tangent”. It is unclear how the sidewall 204c is **near** tangent to both the first and second substantially cylindrical regions 204a, 204b. The degree of “substantially tangent” is unclear. There is no standard in the specification for “substantially tangent”. In order for the sidewall 204c to be tangent to both of the regions, the sidewall 204c must touch the surface of each cylindrical region in a single point. It appears that the sidewall touches the first and second cylindrical regions in several points. Figures 6a,b,c of the appellant’s specification demonstrates that the sidewalls 204c converge beginning with the first cylindrical region 204a towards the second cylindrical region 204b.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Tepman et al. (U.S. 5,730,801).

Tepman discloses an apparatus for processing wafers, which includes: a chamber body

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having an internal volume, the internal volume includes two cylindrical regions (14, 36), a substrate support (63) disposed in one cylindrical region, and the other cylindrical region is in communication with an exhaust system (32). The claimed apparatus does not define structurally over that of Tepman et al.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al. (5,730,801) in view of Benjamin et al. (U.S. 5,820,723).

Tepman et al. discloses a reactive ion etching (RIE) type arrangement for the processing region (14) in a preferred embodiment, but the processing region is not limited this arrangement (col. 5, lines 57-63). Tepman et al. fails to explicitly teach an inductive-coupling plasma arrangement, wherein a flat, inductive coil is disposed on the top wall of the chamber. Referring to Figure 1 and column 6, lines 19-26, Benjamin et al. teaches that it is conventional to generate plasma in the processing chamber using either an ECR reactor, a parallel plate reactor, a helicon reactor, a helical resonator, or an inductive-coupling arrangement, wherein a flat, inductive coil 40 is disposed on the top wall of the chamber. It would have been obvious to provide an inductive-coupling arrangement for the processing region of Tepman et al. because it would have been obvious to substitute one conventional plasma-generating arrangement for another. In such

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an arrangement, a flat coil would be placed on top of the cover (or lid 28) of Tepman et al.'s enclosure and the cover would be made of quartz and flat on top as taught by Benjamin et al. Additionally, it is the Examiner's position that substitution of the parallel plate (capacitively coupled) plasma source with inductively coupled plasma source would have been obvious to one of ordinary skills in the art at the time of the invention. See MPEP 2144.06, Art Recognized Equivalent for the Same Purpose, Substituting Equivalents Known for the Same Purpose (in re Fout, 675 F.2d 297, 213 USPQ 532 (CCPA 1982)).

7. Claims 5-11, 13-15, 21, and 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al. (5,730,801) in view of Shan et al. (EP 0814495).

Tepman et al. fails to teach one or more chamber liners, a plasma confinement flange, and a barrier flange.

Referring to Figure 1, page 3, lines 24-36, page 4, lines 18-41, page 9, line 17-27, page 10, lines 12-49, Shan et al. teaches shields 10, 11, 12, 40 and 42 (liners) which cover a substantially cylindrical processing region adjacent the substrate support 30 and an exhaust region 54 adjacent the chamber outlet 50. The shields are used to prevent unwanted deposits from accumulating on the chamber components such as walls, substrate support, spacers, throttle valve, and vacuum pump (page 9, lines 17-27, page 10, lines 36-49). The liners include opening 26 for the substrate to enter the chamber and opening 51 for the exhaust gases to exit the chamber. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide both the first and second cylindrical regions of Tepman et al. with liners as



taught by Shan et al. since this would prevent unwanted deposits from accumulating on the chamber components such as walls, substrate support, spacers, throttle valve, and vacuum pump.

Furthermore, the annular protrusion 14 of Shan et al. acts as the plasma confinement flange and annular protrusion 16 acts as the barrier flange. The annular protrusions 14, 16 are used to prevent plasma from entering the exhaust port (page 10, lines 46-49). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Tepman et al. with a plasma confinement flange and a barrier flange as taught by Shan et al. since this would prevent plasma from entering the exhaust port.

Regarding Claims 9, 10, 14, 15, 24 and 25, Tepman et al. in view of Shan et al. does not disclose the relative diameters for the cylindrical regions (Tepman et al. 14, 36). However, it is obvious from the drawings that the substrate-processing region (14) has a diameter that is at least 30% larger than the diameter of the exhaust region (36) and is at least 20% larger than the substrate support (62). Also, the relative diameters would have been an obvious design choice to one of ordinary skill in the art. Therefore, where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 77 (Fed. Cir. 1984), cert. Denied, 469 U.S. 830, 225 USPQ 232 (1984).

**(11) Response to Argument**

Appellant has argued claim 1 is defined by the inner surfaces of the sidewalls are

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substantially tangent to the inner surfaces of the cylindrical regions. The appellant has further argued that the term “substantially tangent” refers to a definition of an inner volume and only the inner surfaces of the side walls and cylindrical regions define the inner volume. In addition, the appellant has stated that the two cylinders are tangent in exactly two planes. It should be noted that if an applicant does not define a term (substantially tangent) in the specification, that the term will be given its “common meaning.” *Paulsen*, at 30 F. 3d 1480, 31 USPQ2d at 1674. According to Merriam-Webster’s Collegiate Dictionary 10<sup>th</sup> edition, the common meaning of tangent is (1) meeting a curve or surface in a single point, (2) having a common tangent line at a point, or (3) having a common tangent plane at a point. As stated in the above 112 rejection, it is unclear, from the specification, how the sidewall 204c in embodiments 6a,b,c is **substantially** tangent to both the first and second substantially cylindrical regions 204a, 204b. Figures 6a,b,c of the appellant’s specification demonstrates that the sidewalls 204c converge beginning with the first cylindrical region 204a towards the second cylindrical region 204b. Furthermore, there is no standard in the specification for “**substantially** tangent”. Moreover, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the inner surfaces of the sidewalls are substantially tangent to the inner surfaces of the cylindrical regions) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Additionally, the claim does not preclude the chamber body from having an internal volume and outer surfaces of the side walls being substantially tangent to the outer surfaces of the cylindrical regions of the cylindrical regions.

Appellant has argued that the inner surfaces of the side wall of Tepman et al. are not substantially tangent and appear to be in parallel in the drawings. However, from the top view in Figure 1 of Tepman et al., it is apparent that inner sidewalls 20 are substantially tangent to the two cylindrical regions since the sidewalls 20 converge (are slanted not parallel) between the first cylindrical region (processing region 12, 14) and the second cylindrical region (exhaust region 36).

Appellant has argued that Tepman et al. fails to show an inner volume defined by substantially tangent side walls; however, appellant has admitted that Tepman et al. teaches a chamber with two cylindrical regions and side walls having outer surfaces that are somewhat tangent. The inner surfaces reflect the pattern of the outer surfaces. Furthermore, it is conventionally known in the art, unless specifically stated differently, that the thickness of the chamber walls is uniform. Thus, if the outer wall surface is somewhat tangent with the two cylindrical regions, then the inner wall surfaces are somewhat tangent too since the thickness of the wall is uniform. Moreover, as seen in Figure 1, the inner diameter of the first cylindrical region (processing region 12, 14) is larger than the inner diameter of the second cylindrical region (exhaust region 36), and thus the inner sidewalls 20 are substantially tangent between both first and second regions since the sidewalls converge between the two cylindrical regions. The sidewalls 20 of Tepman et al. are not perfectly tangent between the first and second substantially cylindrical regions (see Figures 1 and 3). Thus, Tepman et al. satisfies the claimed limitation.

Appellant has argued that Tepman et al. and Benjamin et al. references, combined or individually, fail to teach a chamber body having an internal volume defined by first and second

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substantially cylindrical regions and by side walls extending substantially tangent between the first and second substantially cylindrical regions as described in claim 1. In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Tepman et al. discloses the sidewalls 20 that are substantially tangent between the first 12, 14, and second 36 substantially cylindrical regions. Benjamin et al. was simply applied to teach flat, inductive coils disposed on a chamber lid. Thus, the combination of Tepman et al. in view of Benjamin et al. satisfies the limitations of claims 1-4.

Appellant has argued that the Examiner asserts no motivation for combining the shields of Shan et al.'s single cylindrical region to the two cylindrical regions of Tepman et al. The claim requires liners for both the processing region and the exhaust region. Shan et al. was simply applied to teach lining both a processing and an exhaust region, therefore the amount of cylindrical regions (one versus two) is insignificant. Additionally, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Furthermore, in response to appellant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references

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themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation to use liners is to prevent unwanted deposits from accumulating on the chamber components. Thus, the combination of Tepman et al. in view of Shan et al. satisfies the limitations of claims 5-11, 13-15, 21, and 24-25.

Appellant has argued that there is no motivation to insert liners in the removable base 20

Shan et al. was simply applied to teach lining a chamber and exhaust region. In response to appellant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation to use liners is to prevent unwanted deposits from accumulating on the chamber components. Thus, the combination of Tepman et al. in view of Shan et al. satisfies the limitations of claims 34-36.

Applicant has argued that Tepman et al. and Shan et al., alone or in combinations, fail to show a chamber body having an internal volume defined by a first and second substantially cylindrical regions, and by straight side walls extending substantially tangent between the first and second substantially cylindrical regions; one or more liners defining within the internal volume a substantially cylindrical processing region within the first substantially cylindrical region and a substantially exhaust region within the second substantially cylindrical region,

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wherein the substantially cylindrical processing region communicates with the substantially cylindrical exhaust region through one or more openings defined by the one or more liners, a substrate support disposed in the substantially cylindrical region; and an exhaust system in communication with the substantially cylindrical exhaust region through an exhaust port in the process chamber. However, as seen in Figures 1 and 3, Tepman et al. teaches a chamber body having an internal volume defined by a first and second substantially cylindrical regions 14, 36, and by straight side walls 20 extending substantially tangent between the first and second substantially cylindrical regions 14, 36; wherein the substantially cylindrical processing region 12, 14 communicates with the substantially cylindrical exhaust region 36 through one or more openings 22; and a substrate support 63 disposed in the substantially cylindrical region 12, 14 (see Figure 2); and an exhaust system 32 in communication with the substantially cylindrical exhaust region 36 through an exhaust port in the process chamber. Furthermore, Shan et al teaches providing liners 10, 11, 12, 13, 40, and 42 to cover a substantially cylindrical processing region and an exhaust region 54 (see Figure 1). Thus, the combination of Tepman et al. in view of Shan et al. satisfies the limitations of claim 11.

In summary, obviousness is determined based on the factual inquiries set forth in *Graham v. John Deere Co.*, 148 USPQ 459 (1966), namely determining the scope and content of the prior art, ascertaining the differences between the prior art and the claims at issue, resolving the level of ordinary skill in the pertinent art, and considering objective evidence present in the application indicating obviousness or unobviousness. In the instant appeal, the scope and content of the prior art is best represented by Tepman et al., and the difference between Tepman et al and the claimed invention is the use of a flat, inductive coil disposed on the chamber lid and one or more

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liners within the processing region and the exhaust region. As this difference is fairly suggested by Benjamin et al. and Shan et al., both it and the claimed invention as a whole would have been prima facie obvious to one of ordinary skill in the art the time the invention was made.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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